PATENT

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APPLICATION FOR PATENT

ON

OPTICAL ALIGNMENT SYSTEM

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OPTICAL ALIGNMENT SYSTEM

CROSS REFERENCE

[0001] The present application is a Continuation-In-Part, under 35 U.S.C. §120, of United States Patent Application Serial Number 10/174,731, entitled: *Cutter With Optical Alignment System*, filed on June 19, 2002, which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to the field of cutting devices and more particularly to an optical system for aligning a workpiece to a cutting device.

BACKGROUND OF THE INVENTION

[0003] Table saws typically form the core of any woodshop. Often a woodworker's first purchase will be a table saw because of it versatility, accuracy, and ease of use. A table saw's versatility may cause additional considerations for manufactures. For example, table saws are usually equipped with a fence, which may be disposed on either side of the saw blade, for aligning the workpiece. Additionally, table saws often are outfitted with slots extending parallel to the saw blade for receiving sliding miter gauges, panel alignment devices (for plywood, etc.). For example, manufactures may include a slot in the support surface on either side of the blade to accommodate user preferences, the saw's environment, and the like. Thus, a workpiece may be aligned on either of the flat sides of a circular saw blade included in the table saw.

[0004] One difficulty for woodworkers is aligning the workpiece to the cutting device. A workpiece is aligned to the edge of the saw blade's kerf on which the desired piece is located. A blade's kerf, or the channel of material removed during cutting, depends on a number of factors such as the width of the blade, the size of the blade's teeth, the planarity of the blade, and the like. For example, a user may have to adjust the distance

of the fence to take into account for the kerf of the blade being used. In other instances, such as when utilizing a sliding miter gauge or cross-cutting, a user will work up to the final cut (by making a series of cuts or initiating contact between the blade and the workpiece at a longer length than is desired) to ensure that the final cut is exact. While these techniques have been employed, they are time consuming, cause inefficiency and may lead to user dissatisfaction with the tool.

[0005] Therefore, it would be desirable to provide an apparatus for aligning a workpiece on either side of a blade's kerf for utilization with table saws.

SUMMARY OF THE INVENTION

[0006] Accordingly, the present invention is directed to an optical alignment system for a table saw. The optical alignment system of the present invention may be configured to project a first optical indicator and a second optical indicator for promoting workpiece alignment on either side of a rotating cutting blade.

[0007] In an aspect of the invention, an optical alignment system includes a support for positioning the system so that a first optical indicator and a second optical indicator are projected by at least one emitting device included in the system. An alignment device is further included in the system to permit adjustable alignment of the first and the second optical indicators individually with respect to one of a first side and a second side of a kerf created in a workpiece.

[0008] In another aspect of the invention, a first and a second optical emitting devices are included in an optical alignment system for indicating a first and a second side of a kerf created in a workpiece by operation of a rotating blade. Additionally, each of the optical emitting devices may be mounted in individual mounting assembly for permitting alignment of the first and the second optical indicators with respect to the sides of the kerf.

[0009] In a further aspect of the invention, a table saw includes a first optical emitting device and a second optical emitting device which are configured so as to bevel with a beveling cutting device extending through a support surface included in the table saw.

[0010] It is to be understood that both the forgoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention as claimed. The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate an embodiment of the invention and together with the general description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The numerous advantages of the present invention may be better understood by those skilled in the art by reference to the accompanying figures in which:

[0012] FIG. 1 is a perspective view of a table saw including an optical alignment system of the present invention;

[0013] FIG. 2 is a cut-away view of an optical alignment system having a first and a second optical emitting devices for projecting a first optical indicator and a second optical indicator substantially in alignment with a first and a second side of a kerf;

[0014] FIG. 3 is a perspective view of an optical alignment device including a splitter;

[0015] FIG. 4 is a side view of an optical alignment system including a splitter with linkages for connecting to a table saw's arbor mounting;

[0016] FIG. 5 is a cut-away view of a guarding assembly implemented with an optical alignment system having a first and a second optical emitting devices for projecting a first optical indicator and a second optical indicator;

[0017] FIG. 6 is an enlarged view of a optical alignment system including a first and a second optical emitting devices;

[0018] FIG. 7 is an exploded view of a optical emitting device and corresponding mounting assembly of FIG. 6;

[0019] FIG. 8 is an exploded view of a mounting assembly of FIG. 7; and

[0020] FIG. 9 is a cross-sectional view of a optical emitting device disposed in a mounting assembly.

DETAILED DESCRIPTION OF THE INVENTION

[0021] Reference will now be made in detail to the presently preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. The optical alignment system of the present invention may be utilized to facilitate proper workpiece alignment with either side of a kerf formed by the operation of a a rotating saw blade in a workpiece.

[0022] Referring to FIG. 1, a table saw 100, including an optical alignment system 102 of the present invention is described. The table saw 100 includes a rotating cutting blade 104 extending through an aperture included in the saw's support surface 106 such as through a throat plate 108. The support surface 106 may include a recessed channel or trough for accepting a corresponding protrusion included on an accessory for directing a workpiece to be cut. For instance, a dovetailed slot 110 may be included in the support surface for accepting a corresponding slide on a sliding miter gauge 112. The table saw may include a dovetailed slot on either side of the blade to allow the workpiece to be positioned on either side to achieve a proper miter cut, accommodate user preference, minimize chipping, and the like. For instance, a single bevel table saw (such as a saw which only has the capability to bevel to the right or left) may require the user to position the workpiece 114 on a specific side of the blade 104 to achieve the proper bevel cut. An optical alignment system 102 of the present invention may be utilized to indicate the position of the sides of a resultant kerf for the saw blade being utilized.

[0023] Referring to FIG. 2, when utilizing a table saw 200 an operator needs to account for the saw blade's kerf or the channel of material which will be removed by operation of the blade 204 in the workpiece 214. A saw blade's kerf may be influenced by the size of the teeth of the blade, the overall flatness of the blade (planarity) and the like. For

example, when cutting a workpiece 214 the saw blade creates a kerf with a first side 216 and a second side 218. Therefore, in order to achieve the desired cut a user aligns the workpiece 214 with the optical indicator on the side of the kerf to which the cut is to be made.

[0024] The optical alignment system 202 may be utilized to project a first optical indicator 222 and second optical indicator 224 substantially aligned with the first and the second sides of the kerf 216 and 218, respectively. For example, prior to use the first optical indicator 222 is aligned with the first side of the kerf 216 (for the blade being employed) and the second optical indicator 224 is aligned with the second side of the kerf (for the blade being employed). For instance, the first and second optical indicators 216 and 218, or indicia may be continuous lines of light, dashed lines, alignment cross-hairs, arrows, or the like visible to the human eye. Preferably, the optical indicators are projected in an area adjacent to where the saw blade 204 contacts a workpiece 214 (i.e. the saw's cutting interface). For example, the optical indicators may be projected as a fan of light which is projected to be visible from adjacent teeth included on the saw blade forward on the support surface/workpiece so a user may align a mark on the workpiece with the optical indicator corresponding to a side of the kerf prior to cutting.

[0025] With reference to FIG. 2, an optical alignment system 202 includes a support device. In a preferred embodiment of the invention, the support device is a splitter 220 included on the table saw 200. In further embodiments, the support device may be a riving knife, a mounting for attachment to a ceiling (over the saw), an over arm guard (i.e. one mounted remotely from the work area extending to cover the saw blade, such as a generally U-shaped arm and plastic guard assembly) or the like for positioning the system with respect to the kerf of the blade. Referring to FIGS. 3 and 4, utilization of a riving knife or splitter (i.e. a back splitter) may be preferable inasmuch as these support devices may be coupled with the beveling mechanism of the saw. For instance, a splitter 410 (including associated linkages 430, 432) is fixedly connected to the saw's arbor

mounting 434 so that the optical alignment system bevels with the saw blade 304. Referring to FIG. 2, thus, the optical alignment system may bevel with the saw blade 204 to ensure proper visual indication when a bevel cut is desired. Referring to FIG. 5, an optical alignment system mounted to a splitter may be disposed to project the first and second optical indicators 222 and 224 through a clear plastic guard. Alternatively, the optical indicators may be projected through an opening on the front of the guard 536 included on the splitter 520.

[0026] Referring now to FIG. 6, an optical alignment system 602 of the current invention is disclosed. Preferably, the optical alignment system 602 includes a first optical emitting device 638 and a second optical emitting device 640. Those of skill in the art will appreciate that a single optical emitting device may be utilized such as by implementing a beam splitter/mirror system for separating the generated light into discrete beams for projection. Utilization of two optical emitting devices may allow for easy lateral beam adjustment, individual alignment, compact emitting units, without the drawbacks such as alignment and vibration concerns which may be associated with a beam splitter mirror system. Suitable optical emitting devices include lasers, gas lasers (i.e. a helium neon laser), a diode laser, a fiber optic emitting device, and the like for generating an indication visible to the human eye. Moreover, optical emitting devices may include a grating and/or a lens for forming a narrow beam of light (such as a line) for projection on the workpiece and/or support surface. In embodiments, the optical emitting device may be powered via a battery supply or from the saw's electrical system such as through the use of transformers and the like for optimization to the emitter's electrical requirements. Preferably, if an optical emitting device is powered from the saw's electrical system the electrical connection will be equipped with a quick connect coupling such as a plug, interlocking connectors, or the like for quickly connecting/disconnecting to the saw's electrical system. For example, when making a non-through cut (such as a dado cut) a splitter and optical emitters may be removed, thus it is advantageous to have a

conveniently positioned quick disconnect electrical coupling to allow easy removal of the alignment system.

[0027] Referring to FIGS. 6 through 8, in exemplary embodiments, individual optical emitting devices (two devices are shown, 638 and 640) are disposed in a mounting assembly for permitting variable positioning of the projected light beam. For example, the optical alignment system may include a bracket 642 for accepting a pair of light emitting devices 638 and 640 (individually disposed in a mounting assembly). As may be seen in FIGS. 7 and 8, a mounting assembly 844 may be configured to allow lateral alignment (with respect to a side of a kerf), rotational alignment (positioning of the indicator with respect to the general direction in which the workpiece enters into engagement with the saw blade), and lateral micro alignment (is the visual indicator skewed from alignment with a side of the kerf). In a further example, a user may laterally adjust the optical emitters to accommodate a blade with a wider kerf, such as a blade with carbide teeth.

[0028] For instance, a laser emitting device 746 is disposed in a mounting assembly 744. The laser barrel may be secured via a friction insert, a set screw (though the mounting barrel) or the like for fixing the laser to the assembly 744. Additionally, a nut 748 may be utilized to secure and/or rotate the laser 746. The mounting assembly 744 includes a macro-lateral adjustment device. For example, the mounting assembly 744 is formed with a protrusion having a laterally extending aperture for accepting a screw 752 or a through pin. In the present embodiment, the barrel mounting 750 may be laterally fixed along the screw 752 via a set screw 754 through an aperture 756 protruding into the lateral aperture. For example, a user may laterally position the emitting device by sliding the barrel mounting 750 to the desired position with respect to a side of the kerf and then fix the position by tightening the set screw 754 into engagement with the screw 752. Additionally, the screw 752/set screw 754 assembly may be implemented to pivot the mounting assembly about the screw 752 extending through the lateral aperture such as if

the bracket is formed with an arced slot, or multiple apertures for accepting the screw 752. For instance, multiple apertures may be disposed about an aperture for receiving the barrel mounting 750. For example, a user may wish to position the screw 752 within an arced slot such that the optical indicator extends further forward of the blade. Those of skill in the art will appreciate that macro lateral adjustment may be accomplished via a threaded adjustment knob assembly, a rail/groove mounting with a push screw, a slotted mounting secured via a screw, and the like for laterally adjusting the laser emitting device with respect to a side of the kerf.

[0029] Referring now to FIG. 8, in a further embodiment, a mounting assembly 844 includes a tabbed sleeve 864 for containing an emitting device. The sleeve 864 may be received in a corresponding recess included in the barrel mounting 850. The tabbed sleeve 864 may be biased via a spring 862 disposed between the tabbed extension 866 and a stop 860 (such as a threaded stop). Utilization of a tabbed sleeve biased by a spring may allow lateral micro adjustment and/or skew correction. For instance, the spring 862 may act to align the optical emitting device whereby the projected light is directed substantially perpendicular to the barrel mounting's primary axis. Referring to FIG. 9, micro-adjustment may be accomplished by threading a stop 958 against or away from engagement with the tabbed extension 966 disposed in a recessed in the barrel mounting 850 (FIG. 8). Therefore, adjusting the emitting device in the barrel mounting 950. (Wherein the recess for receiving the tab is of sufficient size to allow the tab extension to be variably positioned within the recess.)

[0030] It is believed that the apparatus of the present invention and many of its attendant advantages will be understood by the forgoing description. It is also believed that it will be apparent that various changes may be made in the form, construction and arrangement of the components thereof without departing from the scope and spirit of the invention or without sacrificing all of its material advantages. The form herein before described being

merely an explanatory embodiment thereof. It is the intention of the following claims to encompass and include such changes.